WARZYN

June 28, 1991

Robert Swale
Mail Code 5HS-11
U.S. EPA, Region V
230 South Dearborn
Chicago, Illinois 60604

RE: List of Basic Assumptions
for Ecological Assessment
ACS NPL Site

Dear Mr. Swale:

The purpose of this letter is to memorialize our conference call of June 27, 1991 among you, Dan Sparks, (U.S. Fish and Wildlife), and Mike Kierski and me (Warzyn).

Warzyn had previously sent you a list of assumptions we plan to use to make the Ecological Assessment calculations. The assumptions were developed on the basis of the example provided by David Charters (EPA/ERT), subsequent conversations with Dr. Charters, and a literature review. In general, EPA and U.S. Fish and Wildlife were in agreement with the assumptions which we had developed.

We have added a footnote to the assumptions list which indicates that Dan Sparks wanted the hypothetical mink diet to include 25% fish and 25% crayfish. We feel that our assumption, based on existing literature, is more realistic. Therefore, we will be writing the risk assessment on the basis of our assumptions, but we will include a footnote on the appropriate table referencing Dan Sparks' concern. A copy of the basic assumptions is attached.

In our conversation, I requested two additional days complete our write up of the Ecological Assessment, and you agreed that it the additional time would be reasonable. You will receive three copies of the second draft Baseline Risk Assessment on Monday July 1, and six copies of the Ecological Assessment on July 3.

Respectfully Submitted,

WARZYN INC.

Peter J. Vagt, Ph.D., CPG
Project Coordinator

Enclosure

cc.: A. Perellis

THE PERFECT BALANCE
BETWEEN TECHNOLOGY
AND CREATIVITY

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The following is a summary of the assumptions used in the ecological assessment to select chemicals of ecological concern by medium, and assessing risk to biota in the media of concern.

Media of Potential Concern at the Site

- Surficial soil samples at Kapica-Pazmey, sediment samples, ditch surface water samples, and shallow aquifer data were considered to be applicable media of ecological concern at the Site. Shallow groundwater chemical data was used to predict the impact of release of contaminated groundwater to wetlands surface water.

- Chemical concentrations for media of concern are represented by the upper bound 95% confidence limit of the geometric mean. TCL organics detected in media were selected as chemicals of potential concern, as were inorganics above natural background concentrations. Tentatively identified chemicals were not considered quantitatively in the ecological assessment.

- Chronic reference doses (RFDs) based on animal data are generally used for assessing the human toxicity of noncarcinogenic chemicals. These chronic reference doses were used as a means of estimating small game chemical toxicity, with modification. The chronic human reference doses were divided by their respective uncertainty factor to arrive at an estimate of the appropriate chronic reference dose for the species (e.g, rat) which the human reference dose was based upon. For chronic reference doses which were developed based on subchronic animal data, the 10 fold uncertainty factor applied to estimate the chronic reference dose was retained.

- The soil organic carbon-water partition coefficient (Koc) was used as an estimate of the bioaccumulation potential and soil adsorption potential of each chemical.

Selection of Chemicals of Potential Ecological Concern

- A screening method was used to assess the relative importance of each chemical detected in media of potential concern based on the chemicals concentration, toxicity, and bioaccumulation potential.

  The chemical's concentration was multiplied by the inverse of the species-specific reference dose to determine its importance based on concentration and toxicity. The percentage of the total importance for each chemical within a given medium was calculated. For each medium the organic and inorganic analyte with the greatest importance value was selected as a chemical of potential concern for quantitative risk assessment.

  To calculate the importance of the chemical based on its bioaccumulation potential, the chemical concentration was multiplied by the Koc for surface water, sediment, and surface soils. The groundwater chemical concentration was multiplied by the inverse of the Koc because chemicals that bioconcentrate

would be very immobile in the aquifer and would therefore not be released to surface water. Because Koc values are not available for inorganic contaminants and soil-water partition coefficients could not be located for metals of potential concern, screening of inorganics based on bioaccumulation potential was not conducted.

Chemicals of Potential Concern-Toxicity

The following chemicals were the most important based on toxicity and concentration, their respective reference doses are provided in parentheses in units of mg/kg/day:

Surface soil- toluene (20) and cadmium (0.04)
Sediment- bis(2-ethylhexyl)phthalate (2) and mercury (0.03)
Surface water- 2-butanone (5), 4-methylphenol(5), and manganese(10)

Terrestrial Risk Estimates

Risk were assessed to burrowing rodents using the following assumptions:

- Rat toxicity information was used
- Rat food intake and water ingestion rates were used
- It was assumed that the main route of exposure was through oral ingestion of soil and surface water. It was assumed the animal's diet consisted of 5% soil from the contaminated areas, and on-site surface water was used as the sole drinking water source. It was assumed that ingestion of chemicals through food (i.e., plant material) was minor compared to the concentration ingested in soil or sediment.

Theoretical Burrowing Mammal Characteristics (based on the lab rat)

- Body weight = 0.250 kg
- Water consumption rate = 25 ml/day
- Food consumption rate = 15 grams/day
- Soil or sediment consumption rate = 750 mg/day
- Assume home range of animal is small and completely within the contaminated area.

Organic Chemicals of Potential Concern- Bioaccumulation Potential

The primary organic chemical of concern based on bioaccumulation potential was determined to be PCBs for surface soil, sediment, and surface water.

To assess risks based on the bioaccumulation potential of PCBs, the mink was selected as the species of potential concern based on its high level in the food chain and sensitivity to PCBs. It was assumed the mink ate primarily small game, and that based on the concentration of PCBs in surface water, the ingestion of surface water would not pose an appreciable pathway of exposure to mink in comparison to food sources.

- It was assumed the home range of the mink was 20 acres.

- A permissible mink diet PCB concentration of 0.64 mg/kg was used as the reference diet concentration which would be considered safe.

- It was assumed mink ate 90% small game and 10% wetland amphibians. It was assumed based on Site conditions that fish were not likely available for mink to ingest. The ditch was not expected to support fish populations because of its shallow depth and likely anoxic conditions during hot summer months and after winter ice over.(1)

- It was assumed the mink ingested 1/20 of their diet of small game from Kapica-Pazmey and 19/20 of their small game from the wetlands based on the size of these areas.

- It was assumed the the frequency of detection of PCBs in the wetlands sediment (6/18) and at Kapica-Pazmey soil (12/16) represent the frequency of ingestion of a contaminated small game animals or amphibian within the respective areas.

- A bioaccumulation factor (BAF) of 0.07 (small game), and 0.22 (amphibians) were used to assess the bioaccumulation of PCBs in the respective animal groups due to sediment ingestion.(1)

- The predicted food concentration in each animal group for a specific area was calculated by multiplying the concentration of PCBs in the area (e.g., Kapica-Pazmey or wetlands), by the BAF, the proportion of the home range the area encompasses, and frequency of PCB detection in the area. The biota concentrations for each feeding area were added to get the home range concentration of PCBs in the diet for the specific animal group.

Aquatic Toxicity Estimates

The following chemicals were the most important based on toxicity and concentration, their respective reference doses are provided in parentheses in units of mg/kg for sediments and mg/L for surface water.

Sediment- bis(2-ethylhexyl)phthalate (57.5) and mercury (10.2)
Surface water- 2-butanone (1690), 4-methylphenol(4), and manganese(400)

- The sediment reference doses are based on a safe body burden of the chemical in mg/kg. This was estimated by multiplying the chemicals BCF in fish by the chemical's safe concentration in water.

- Reference doses for surface water represent a safe concentration of the chemical based on a bioassay conducted with water alone (i.e., no prey or sediment ingestion)

Risk were assessed to fish using the following assumptions:

- Fish toxicity information was used unless it was unavailable to derive reference doses. If fish data was not available, data on the most sensitive aquatic species that could be located in the available literature was utilized.

- Assumptions of a bluegill's sediment intake (i.e., 1000 mg/day) were used to assess risks due to sediment ingestion. Actual surface water chemical

concentrations were used to assess the risk posed by the absorption of chemicals from surface water. If the shallow groundwater aquifer concentration divided by 100 (i.e., dilution and biodegradation factor) was greater than the actual surface water concentration of the chemical, it was used instead to represent the surface water concentration of the chemical in the wetland.

- It was assumed that the main route of chemical exposure was through oral ingestion of sediment and dermal absorption from surface water. It was assumed that ingestion of chemicals through food (i.e., plant material and prey flesh) was minor compared to the concentration ingested in soil or sediment ingested directly, or indirectly through the ingestion of prey species (i.e., within the gastrointestinal track of the prey species).

- Fish body burdens, as a result of sediment ingestion, were calculated by dividing the product of the sediment concentration (mg/kg), the daily consumption rate of sediment (0.01 kg), and bioaccumulation factor (BAF; unitless) for the chemical by the fish's weight (0.125 kg). It was assumed the fish ate this amount of sediment on a continuous basis (i.e., steady-state conditions were reached).

Theoretical Fish Characteristics (based on the bluegill)

- Body weight = 0.125 kg
- Food consumption rate = 10 grams/day
- Sediment consumption rate = 1000 mg/day
- Assume home range is small and completely within the contaminated area.

Footnote:

(1) In the main body of the BRA text, the risk calculations for mink will be presented using the assumptions Warzyn believes to be appropriate based on site conditions. Footnotes will be added as appropriate to present the mink risks using the U.S. Environmental Protection Agency's and Fish and Wildlife Service's assumptions. The following are the alternate assumptions requested by the agencies.

- It will be assumed mink eat 40% small game, 25% fish, 25% crayfish and 10% wetland amphibians.

- A bioaccumulation factor (BAF) of 0.07 (small game), 0.22 (amphibians), 7 (fish), 5 (crayfish) will be used to assess the bioaccumulation of PCBs in these animal groups from sediment.